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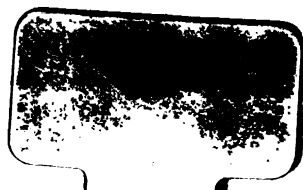
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LITHOTOMY, LITHOTRITY
ETC.

R. HARRISON, F.R.C.S.





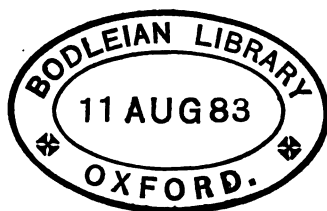
OBSERVATIONS
ON
LITHOTOMY, LITHOTRITY,
AND THE
EARLY DETECTION OF
STONE IN THE BLADDER,
WITH A DESCRIPTION OF A
NEW METHOD OF TAPPING THE BLADDER.

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TO

MY ESTEEMED FRIEND,

SAMUEL D. GROSS, M.D., LL.D., D.C.L. OXON.,

EMERITUS PROFESSOR OF SURGERY IN THE
JEFFERSON MEDICAL COLLEGE OF PHILADELPHIA:

WHO ADORNS THE PROFESSION OF SURGERY,

THESE PAGES

ARE MOST RESPECTFULLY DEDICATED.

PREFACE.

THESE observations are, for the most part, based upon cases which, from time to time, I have brought under notice at various Medical Societies. The important advance recently made in the treatment of Stone in the Bladder has necessarily added to the interest of this subject, and must be my apology for the opinions I have here ventured to express.

I have also added a description of a method of tapping the bladder, which I believe has the advantage of safely affording something more than temporary relief.

APRIL, 1888.

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LITHOTOMY.

THE following observations are founded upon some experience of the operative treatment of Stone in the Bladder. This has been obtained from the two general hospitals with which I have been connected, and from private practice, and embraces not less than sixty operations, including both lithotomy and lithotrity, performed upon different individuals.

The calculi which have been removed by me, with few exceptions, form part of the collection in the Museum of the Royal Infirmary. The specimens having some special interest connected with them are referred to in the recently published catalogue.* No. 130 is the largest recorded example of cystine, weighing 1,050 grains; the other half of it will be found in the Museum of the Royal College of Surgeons.

I shall not attempt to draw a comparison between lithotomy and lithotrity on a basis formed by an aggregation of cases taken from the practice of different surgeons, but purpose confining myself to certain clinical points which, in the experience alluded to, have come under my observation.

Though the repetition of either operation adds to the manipulative dexterity of the individual surgeon,

* *Descriptive Catalogue of the Royal Infirmary Museum*, by Various Authors. 1883.

and his judgment becomes matured in selecting the precise method to be employed, yet the information, gathered from various sources where the conditions are often dissimilar, though statistically interesting, does not appear to me to be of much further value. Every patient, whether young or old, who has a stone in the bladder, is to be regarded as an individual study presenting some peculiarity on the recognition of which the success of the treatment in a large measure depends.

In children—that is to say, in males under sixteen years of age—I have, with few exceptions, practised lateral lithotomy. Where the stone has been known to be small, the median operation, or lithotrity, has been chosen. To the latter proceeding, as applicable to children, under special circumstances, reference will presently be made.

In the performance of the lateral operation, I have endeavoured to keep as closely as possible to the lines laid down by Cheselden, whose name will always be associated with it.

Lithotomy is one of the few operations in surgery in which from first to last there need be no change in the way the knife is held by the surgeon. It should be

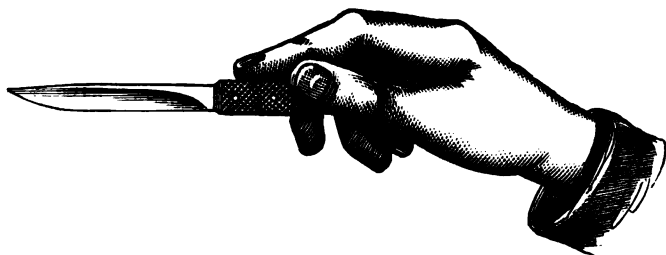


Fig. 1.

held as represented in the Plate. (Fig. 1.) No other position permits of the freedom of movement which is necessary to the dexterous execution of the proceeding. Commencing about an inch in front of the anus, the point of the knife should be steadily directed towards the staff, with the view of touching it in the membranous urethra, below the line of the bulb, the incision being enlarged downwards and outwards to the extent of about two inches, or even more should the size of the stone require it, as the knife is withdrawn. It is assumed that, by one or other of the methods presently to be described, the surgeon has been able to form a tolerably accurate notion of the size and constitution of the stone to be removed. If the incision is fully made, both in depth and direction, the staff will at once be felt by the finger of the other hand, or be so nearly bared as only to require a touch or so with the point of the knife. The bladder is then opened by cautiously pushing on the knife in the groove of the staff, the edge being directed obliquely outwards, so as to incise the prostate in a direction corresponding with its broader axis.

During recent years various modifications have been made in the staff which guides the knife into the bladder after the perineum has been opened. Much has been said in favour of the rectangular staff introduced by Dr. Andrew Buchanan in 1848 (Fig. 2), on the ground that it facilitates the steps of the operation by substituting a straight for a curvilinear groove in which the point of the knife runs. Though I

have seen surgeons cut with much dexterity on the rectangular staff, I have never felt tempted to forsake the curved one with the slightly lateral groove. Habit, undoubtedly, has much to do with the acquirement both of confidence and dexterity. Not many surgeons would prefer to cut for stone with the lithotome, yet my friend Dr. Alan P. Smith,* of Baltimore, attributes a large amount of his success to its use. The instrument is here shown. (Figs. 3 and 4.)

I do not remember ever having much difficulty in reaching the groove in the curved staff, and therefore I may be excused for not admitting that the operation is simplified by an angular instrument. Though referring to my own preference in the selection of a staff, I have no wish to undervalue an instrument the principle

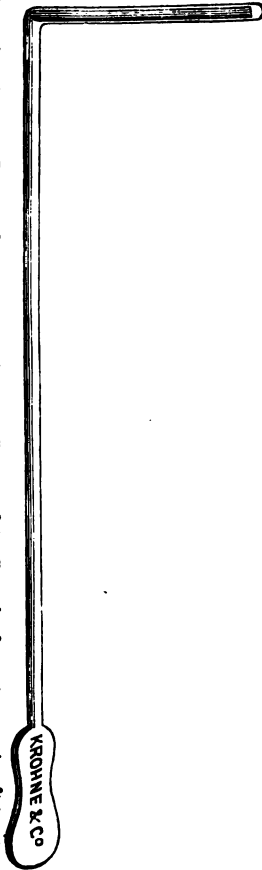


Fig. 2.

of which has been approved by such practical surgeons as Professors Annandale and George Buchanan, in addition to other practitioners who, to my knowledge, employ it.

The long beaked staff described by Dr. J. Ward

* A Report of fifty-two successful cases, *Trans. Med. and Chir. Faculty of Maryland, U.S.A.*, 1878.

LITHOTOMY.

5

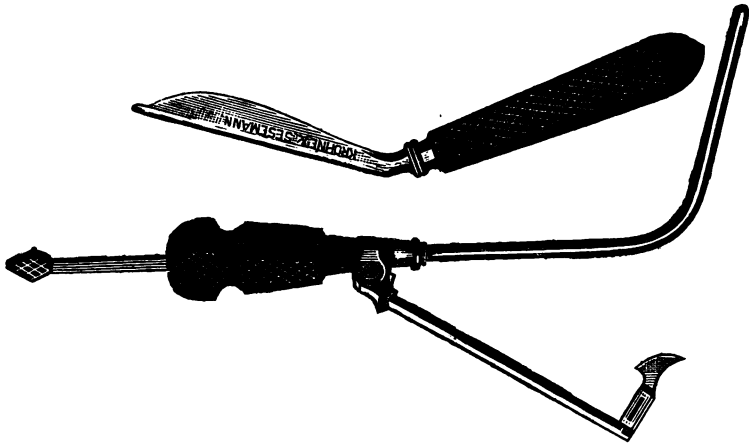


Fig. 3.

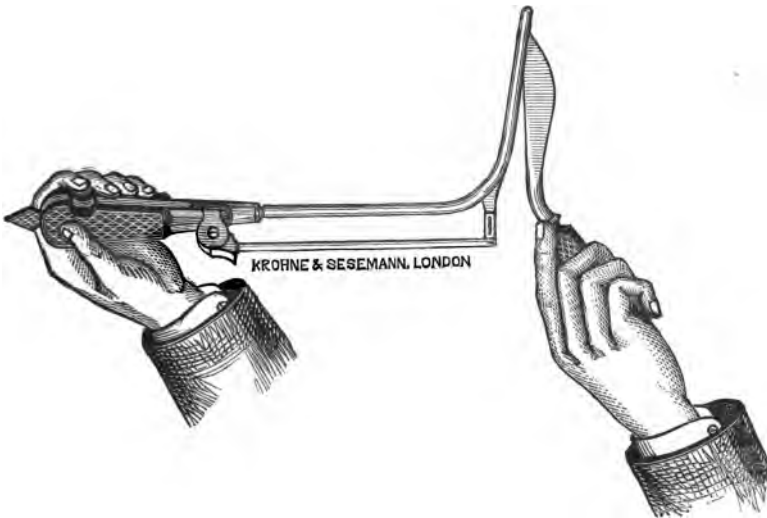


Fig. 4.

Cousins * evidently possesses several advantages. I have found the best shaped staff for ordinary purposes to be that represented in Fig. 5. When used for very young children, in whom the bladder is an abdominal rather than a pelvic organ, it must be held more obliquely than in the adult; otherwise, as the curve is a short one, the extremity of the staff may hardly be within the bladder. The oblique positions of the staff and the knife, in operations on young children, have been well illustrated by Mr. Bickersteth.†

I have from time to time had to use staffs of very different sizes. In an instance at the Royal Infirmary, the urethra of a child, aged two years, was so small that a staff had to be made for the occasion.

A rule I have already mentioned—namely, to endeavour to touch the staff with the point of the knife as the first incision into the perineum is made—has, so far, saved me from all difficulty in making the deeper one.

We sometimes hear of cases in which the bladder has not been reached. This could hardly happen, assuming the staff to be correctly held, if, after the perineum is opened, the index finger of the operator's

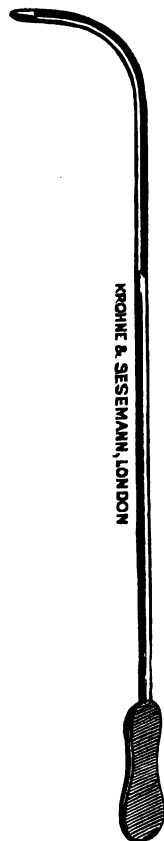


Fig. 5.

* *British Medical Journal*, vol. ii., 1882.

† *Liverpool Medical and Surgical Reports*, vol. i., 1867.

left hand (the right hand being occupied by the knife) is confined to *gently feeling* for the staff, or protecting the rectum from risk or injury. When the first incision penetrates but little beneath the skin of the perineum (as often occurs in first operations), the distance to the staff appears so great that a process of boring or tunneling with the finger towards the staff, rather than cutting with the knife, sometimes ensues. If this is continued, either the operator is landed between the bladder and the rectum, or the urethra gets torn across, and the way to the bladder is lost. When the staff is *felt* to be bared, then the nail of the left index finger serves as a guide for steadying the point of the knife in the groove prior to the commencement of the deeper incision.

It may seem superfluous to refer to minutiae such as these, but my own experience, in addition to that which I have derived from watching other operators, leads me to the conclusion that the reaching of the staff, and the insertion of the point of the knife in the groove, are the anxious parts of this proceeding, and that it is impossible to be too explicit in mentioning details which have proved of great practical importance. In those unfortunate cases, happily rare, where the operation has broken down at this stage, and the patient has been removed from the operating table with the stone still in his bladder, I believe I am correct in stating that a fatal result has almost invariably followed. Such, at all events, has been the termination in the few instances of the kind which have been communicated to me. Hence the import-

ance of a careful study of all details which may be considered as contributing towards success.

The deep incision along the groove in the staff should be made sufficiently free, so far as the prostate is concerned, to permit an average-sized index finger, aided by some degree of dilatation, to enter the bladder with tolerable ease, whilst, on the other hand, it must stop short of a complete section of the gland.

It will be remembered that the introduction of the finger into the bladder is one of the conditions of the operation of lithotomy, whether performed in the child or adult, and there need be no difficulty in determining the precise means by which this object may be obtained with the least amount of risk. In the adult, if, when the perineum has been opened, the handle of the staff is held vertically whilst the blade of the knife is pushed on towards the bladder, nearly parallel with the direction of the groove in which it is lodged, no fear need be entertained of exceeding the proper limits of an incision into the prostate. If, on the contrary, the handle of the staff be too much depressed, whilst at the same time the *point* alone of the knife is carried along in the groove, the range of the incision may become so extensive as to include more than the prostate in the section. In this way, not only has the gland and its capsule been cut completely through, but even the trigone has been invaded.

Or the matter may be put as follows:—At the close of the incision into the prostatic urethra, the relation of the back of the knife to the groove in the staff should be that represented by nearly parallel

lines, or, at the most, a very slight angle. Provided this position be maintained, and the point of the knife be steadily kept in the groove, there will be little risk of exceeding the safe limits of an incision, even though the knife be pushed, as it need not necessarily be, to the end of the groove in the staff. If the staff is fairly well hooked up under the arch of the pubis, its beak will be some distance above the floor of the bladder.

My reason for alluding to these points is, that surgeons undertaking lithotomy on the living subject for the first time frequently ask what are the rules for placing a safe limit on the deep incision by which the bladder is entered. The answer that would probably be given by those who have learnt from experience how to conduct this operation, is to the effect that they are guided at this stage of the proceeding by the degree of *resistance* they find it necessary to overcome—an answer which, though correct, is unsatisfactory to the novice who, under the term “resistance,” suspects the possibility of the inclusion of structures which are to be avoided. I have endeavoured, therefore, to indicate that, in ordinary cases of lithotomy, regard to certain considerations and positions will free the operator from incurring the risks which he may anticipate, but seldom realises.

When the finger is in the bladder, it is easy to extend the incision with a probe-pointed knife, should dilatation not suffice either for introducing the forceps or extracting the stone. If the opening will not allow

of the easy passage of the forceps *into* the bladder, it is not to be expected that they can be withdrawn with a stone between their jaws, without inflicting unnecessary damage to, if not tearing, the parts constituting the neck of the viscus.

To anyone practically unacquainted with lateral lithotomy it may appear that attention to the many details it includes must necessitate some time to be taken up in its performance. Such, however, is not the case; and though care is to be commended rather than speed, there is nothing in cases free from complication to prevent the operation being safely accomplished in a few seconds. Rapidity in manipulation must, however, come naturally, rather than be aimed at. The object of the operator is to extract the stone from the bladder without exposing the patient to unnecessary risk, and so long as the surgeon accomplishes this, he may regard the time occupied, whatever it may be, as well spent.

It is not my custom to inject water into the bladder before operating, or to give any special direction with the view of having urine retained in anticipation. An empty and, if possible, a contracted rectum should be secured. A curved and a straight pair of lithotomy forceps should be at hand; and, in removing the stone, only gentle traction forwards and slightly downwards is to be exercised.

Angular stones, or those with spike-like processes, are sometimes more or less embedded in the walls of the bladder. When this is the case, the position of the calculus must be altered before it can be withdrawn

by the forceps, otherwise the floor or neck of the bladder may be torn. I have known stones rendered stationary in this manner spoken of as being adherent to the walls of the bladder, such a connection being, of course, only a mechanical one. A scoop, and a Higginson's syringe for washing out the bladder through the wound, are sometimes required when the stone breaks on being seized with the forceps. Professor Humphry, of Cambridge, seems to have a preference for the scoop.*

When the stone is large, too large to come away without the exercise of such force in extraction as might tear—not stretch—the neck of the bladder, a corresponding incision on the opposite side of the prostate may be made with a straight probe-pointed knife (Fig. 6), on the operator's left index finger passed



Fig. 6.

fairly within the bladder, should an extension of the existing incision be insufficient. On three occasions I have thus made a bilateral incision with success. In one instance where it was employed, it permitted me to remove, without hæmorrhage, a prostatic tumour (an adenoma), in addition to an oxalate stone weighing two ounces and five drachms.† Mr. Bickersteth has also enabled me to record a similar example.

Though a bilateral section of the prostate is the

* *The Lancet*, June 1st, 1872.

† *Royal Med. Chir. Trans.*, vol. lxx.

practice which, under the above-named circumstances, I have reason to commend, I know that some surgeons have divided the gland upwards, and others downwards. The small space afforded by the gland within its capsule, in these directions, is not favourable to either of these courses, both of which are easier of performance than the division of the opposite side, as I think is more generally preferred. I have known both the upward and downward division of the gland to be followed by complications—the former by sup-puration behind and above the pubes, and the latter by wound of the bowel.

The accompanying diagram is an exact representation of a vertical section of a frozen prostate taken from a man, aged 35. It is introduced for the purpose of indicating the extent to which the gland may be incised in various directions, shown by the black lines, and the probable amount of additional room that such incisions would afford. (Fig. 7.)

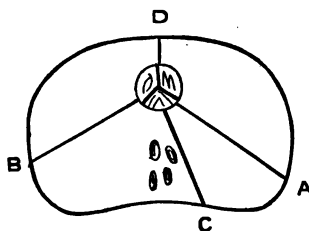


Fig. 7.*

After a stone has been extracted, the bladder

- * A. Lateral incision.
- A.B. Bi-lateral do.
- C. Downward do.
- D. Upward do.

should be carefully searched, to ascertain that it is clear. The index finger is the most trustworthy explorer, aided by downward pressure with the other hand above the pubes. If these means be found insufficient, an ordinary sound may be introduced through the wound.

Formerly my practice was not to introduce a tube through the wound into the bladder after the operation, but now I recognise that that procedure possesses an advantage other than that of preventing clots obstructing the free discharge of urine. By attaching a piece of rubber tubing to it, a considerable portion of the urine may be conveyed into a receptacle by the bedside, and the patient thus be kept drier and more comfortable.

The old-fashioned gorget is an instrument I have found of considerable service when, by reason of the depth of the perineum or the size of the prostate, it has been necessary to supplement the ordinary incisions of lithotomy for the purpose of reaching the bladder, and guiding the forceps within it. By the aid of the gorget the bladder may be safely entered so as to allow the forceps to be introduced. As the instrument enters the bladder, a gush of urine usually takes place, which at once frees the operator from any doubt on this point, though he may not be able to ascertain it with the finger. When, under these circumstances, the lithotomy forceps are within the bladder, the staff and the gorget may be removed. In this way I have safely opened bladders and piloted my forceps within, when my finger has proved insufficient for the purpose.

I have had but one serious case of secondary hæmorrhage after lithotomy.

It occurred in a young man from whom I removed a stone over two ounces in weight by a bilateral incision of the prostate, on which occasion my friend Professor S. W. Gross, of Philadelphia, was present. The case was complicated with stricture and perineal fistulæ of long standing. Seven days after the operation the patient had a sharp attack of hæmorrhage, consequent upon an acute diarrhœa. On investigation, it was discovered that this was caused by his having partaken freely of marmalade, with which he had been surreptitiously supplied by a visiting friend. Mr. Rushton Parker, happening to be in the ward at the time, succeeded in arresting the bleeding. The patient eventually made a good recovery; the old perineal fistulæ also closed.

The case further points to the necessity of carefully regulating the diet during convalescence from lithotomy, and the avoidance of diarrhœa. As a rule, I do not allow the bowels to be disturbed for some days after the operation, and then only with a simple enema.

In the few cases of hæmorrhage in adults immediately following lithotomy, where there were no vessels that could be tied, I have found much advantage from the use of Mr. Buckston Browne's dilatable tampon. (Fig. 8.) It is a valuable instrument with which surgeons opening the bladder by incision from the perineum should be provided.

When the artery of the bulb has been divided, I have never seen any difficulty in securing it with forceps and a ligature, if the perineum has been

sufficiently opened, and not merely stabbed; nor do I remember circumstances arising which caused

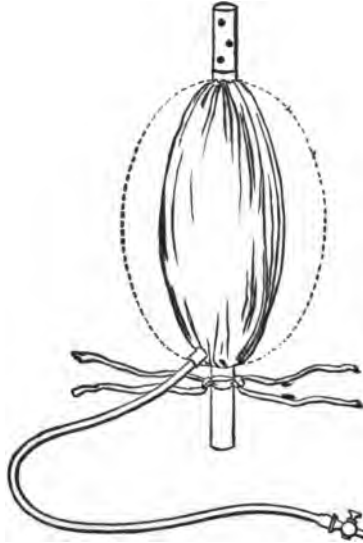


Fig. 8.

me to stop to take up bloodvessels, or otherwise to arrest hæmorrhage, until the operation was practically over. This necessity, however, might arise if, for any reason or other, there were delay in reaching the staff and completing the deeper incision. Hæmorrhage from the neck of the bladder is, in adults, usually venous; if excessive or continuous, it is dealt with most safely by a tampon, which may be retained for forty-eight hours, and then substituted by an ordinary lithotomy tube, to be used in the way I have described.

From other accidents liable to occur in the course of lithotomy, such as wounding the rectum or dividing

any large normally or abnormally placed bloodvessel, I believe I have remained so far entirely free.

One of these occurrences—viz., wounding the bowel—will occasionally happen, even in the hands of experienced and careful operators. A case recently came under my notice, illustrating a point in the after-management of this accident, which is worth recording.

A gentleman, æt 34, was referred to me by my friend Dr. J. De Vere Hill, of the Cunard Service, under the following circumstances:—About 1867, when aged 16 years, he had undergone lateral lithotomy in this country by a very eminent surgeon. Unfortunately the rectum was opened into, and, in spite of treatment, a fistulous communication was the result. The inconvenience, however, was limited to the escape of urine when the bladder was full, and no apparatus was then necessary. Two years previous to my seeing him, an attempt had been made by a distinguished surgeon in America to close the fistula with the cautery, but unfortunately with the result of making the opening larger and the inconvenience greater. To remedy this, he had a sort of air tampon (Fig. 9) made by Messrs. Tiemann, of New York, which very effectually stops the leak, and permits the patient to go about his usual avocations, and to ride, with but little inconvenience. He consulted me in reference to a small pile which came in the way of the tampon whilst being introduced, and which I removed with the clamp and cautery.



Fig. 9.*

* Letter *l* shows where the inflating pump is attached; *a*, the stopcock below; *m* is the round spoon-shaped metal disk, narrow and elongated, and open below; *i* is the perforated tube extending to the end of the globe (inside the globe). The globe, *b*, of pure thin rubber, is now inflated. The drawing is about half size.

The cicatricial character of the fistulous track would render any attempt to close it by a plastic operation of very doubtful utility.

In reference to the mortality following my cases of lithotomy, I am only aware of two deaths, and these appeared to be unconnected with the operation. Let the cases speak for themselves.

The first was that of a delicate boy, eleven years of age, who for years had suffered from symptoms of stone, and from whom I removed, by the lateral operation, a large phospho-oxalate calculus. Some weeks after he left the Infirmary, I heard that he died of suppurative pyelitis.

The other case was that of a gentleman of advanced years, whom I saw in consultation with Dr. Turnour, of Denbigh, and whose bladder I opened for most distressing symptoms of irritability, accompanied with sanguineous muco-purulent urine. The cause of this was an enormous prostate. Though no stone could be felt with a sound, I suggested a lateral cystotomy as the most likely way of relieving him. Assisted by my colleague, Mr. Banks, I opened the bladder with the gorget, as it was quite impossible to reach it with the finger. On exploring behind a large irregular prostate with a pair of well-curved forceps, a moderate-sized phosphatic calculus was found. It was clear, however, that such a stone could only be incidental to the disorder, and was not the cause of it. The operation was performed without difficulty or hæmorrhage, and for a fortnight the patient seemed benefited by it in many ways; still the urine never lost its muco-purulent character. Then a state of ammoniæmia set in, in spite of the thorough manner in which the bladder was cleansed, and he gradually sank. I expect the condition of the bladder was largely shared in both by the ureters and the kidneys.

With these exceptions, my lithotomy cases—over

forty in number—have made good and, I believe, permanent recoveries. There is one calculus (No. 117) which was taken, after death, from the bladder of a man fifty-six years of age. I had previously detected the stone, but as the patient was sinking when admitted, I declined to operate.

In the few median operations I have performed, where the stones were small, the membranous urethra was opened in the usual manner on a centrally-grooved staff. This permitted the introduction of the finger, and subsequently of the forceps. It is interesting to note that this simple operation on the urethra, which has long served for the extraction of stones from the bladder, is now utilized for exploration, for the treatment of chronic cystitis, and for the removal of bodies other than calculi.

For stone the median is not an operation that commends itself to me; though easily performed, and tolerably free from the risk of hæmorrhage, it does not provide the same opportunity for manipulating, either with finger or forceps, whatever the bladder may be found to contain. Still, on the other hand, it must not be forgotten that some very experienced operators have almost entirely confined themselves to this method. Mr. Vartan* has recently published an account of forty-four cases in which the median operation was performed with considerable success, combined, when the stones were large, with Civiale's bilateral division of the prostate.

In the present day, owing, I believe, to more

* *Edinburgh Medical Journal*, May, 1882.

accurate observation and correct interpretation of symptoms, cases where vesical calculi have attained considerable dimensions are rare. I have not removed a stone over three ounces in weight, and, so far, I have been able to extract calculi by some modification in the lateral operation, as already mentioned. Should I have to deal with stones of an exceptional magnitude, where I had reason to anticipate difficulty or danger in extracting them through the perineum, I should perform the high operation above the pubes. I believe that in some cases of this kind, where there has been a difficulty, by reason either of its shape or size, in removing the stone through the supra-pubic incision, much damage to the bladder from manipulating the stone in the forceps, and ineffectual attempts to extract, might have been averted by making, in addition, an incision as for median or lateral cystotomy, by which the position of the stone could be altered with the finger from the perineal wound, whilst the forceps were applied through the supra-pubic opening. In this way the lever and the forceps could be advantageously combined for a common purpose. Several cases of supra-pubic lithotomy have, I believe, proved fatal by damage inflicted on the bladder—an accident which might have been avoided by a more accurate adjustment of the stone to the extractor.

As bearing upon such a proposal, I will quote from a case of lateral and supra-pubic lithotomy recorded by Dr. Alexander Paterson.*

* *Glasgow Medical Journal*, April, 1882.

The lateral incision having been made, "on introducing my finger, I at once expressed a doubt as to the possibility of safely removing the stone by this incision, due not so much to the size of the stone, though large, as to the extraordinary sharp spicular surface which it presented. The original wound was cautiously enlarged by means of a probe-pointed bistoury, but the inevitable extensive laceration and bruising which must have attended removal induced me to desist from any further attempt to extract it in that situation. An incision in the median line was now made, three inches in length, just above the pubes, and by careful dissection the reflection of the peritoneum was exposed and held back; then the upper part of the anterior wall of the bladder was divided, and the stone easily grasped by the forceps. The greatest difficulty was experienced here, and it was only after introducing a scoop, and levering it, that the stone was at length extracted. The extraction was assisted by a finger placed in the rectum supporting the calculus. The edges of the supra-pubic wound were brought together, and a drainage-tube inserted."

The thorough manner in which the double wound permitted drainage to be carried out—a point of considerable importance in the after-treatment of lithotomies where very large stones have, as it were, made beds for themselves, in which they have lain—no doubt contributed to the successful issue of this case. Seventeen days after the operation the patient was well, passing all his urine through the natural channel. The calculus measured six inches in its long circumference, and five and a half inches in its short.

In the removal of a tumour from the bladder, the value of a double opening, for the purpose of both

manipulation and drainage, has been further evidenced by a case recorded by Billroth.*

In reference to the making of two openings into the bladder to meet special circumstances, I quote the following passage from a recent author:†—"It is said of Frère Côme (1758-1778), whose high operations for stone were so successful, that, in order to prevent urinary infiltration, he was in the habit, before performing epicystotomy, of opening the urethra in the perineum. The value of perineal drainage was also appreciated by Civiale, who, according to Bransby Cooper (Coulson, p. 475), while engaged in the high operation for stone, accidentally wounded the peritoneum, and fearing extravasation of urine into the peritoneal cavity, opened the bladder through the perineum, and the patient recovered."

Dr. Howe,‡ of New York, records a case where he successfully removed a stone from the bladder weighing 3,541 grains. The patient was only sixteen years of age. A supra-pubic and a perineal incision were made, through the former of which the stone was extracted, great assistance being at the same time rendered by the index finger passed into the bladder through the perineal opening. Dr. Howe observes, "From a careful study of this case, and from an examination of the records of the extraction of large calculi through the perineum and rectum, I am convinced that the supra-pubic operation is the only safe

* *Erichsen, Science and Art of Surgery*, 7th ed., vol. ii., p. 849.

† *A Study of Tumours of the Bladder*, by Dr. A. W. Stein. New York, 1881.

‡ *New York Medical Journal*, Feb. 17th, 1883.

one. The stone can be removed without lacerating important organs. Free drainage can be kept up through a perineal opening, as well as through the lower extremity of the abdominal incision, thus reducing to a minimum the danger arising from urinary infiltration and peritonitis."

In concluding these observations upon lithotomy, I would remark that I do not think there is any operation of corresponding importance which has yielded more satisfactory results. Its dangers are for the most part connected with accidents directly arising out of the doing of it. Where the operation has been free from such complications, I am not aware of anyone having had occasion to regret its performance in appropriate cases.

LITHOTRITY.

BEFORE offering any observations more directly connected with my own experience of the Lithotritry of to-day, I will briefly allude to a change which may be regarded as an epoch in the history of this operation.

To within a few years ago, Civiale's method of operating had been practised in this country and elsewhere with a considerable amount of success. The proceeding consisted in the breaking up of the calculus by the lithotrite, at one or more sittings, according to circumstances, the fragments being either partially removed by appliances such as Clover's instrument, or allowed to escape spontaneously with the urine. Each sitting, or rather breaking of the calculus, was limited to a few minutes, there being a general agreement that anything like a prolonged use of the lithotrite was hazardous. This practice was attended, with few exceptions—where the stones were so small or so friable as to be crushed with one or two grips of the lithotrite—with the retention in the bladder, for varying periods, of pieces of rough and broken stone, which had no means of escape other than those mentioned. Here, then, was a fruitful cause of cystitis, which necessarily became a serious complication.

Though this method of removing stone from the

bladder has now been largely superseded by that which I am about to describe, it is only right to state that some surgeons, amongst whom I may mention Mr. Berkeley Hill* and Mr. West† of Birmingham, consider that there are cases to which the older method still remains applicable.

I will now proceed to notice what may be called the second epoch, as distinguished from Civiale's, in the history of the crushing operation for stone. For this purpose it will be convenient to offer a brief narrative of the circumstances under which the proceeding first came under my notice. In January, 1878, an article by Professor Bigelow, of Boston, "On Lithotripsy by a single operation," appeared in the *American Quarterly Journal of the Medical Sciences*. On April 6th of the same year, I was present at the Massachusetts General Hospital, and saw Dr. Bigelow remove a large uric-acid stone from the bladder of a man, by a proceeding which, to my mind, was distinctly different from anything I had previously seen or read of. The chief points of distinction seemed to me to be (1) the recognition as a principle of the possibility and propriety of the removal of the entire stone, without reference to its size, from the bladder at one operation; and (2) the employment of an evacuating apparatus adequate to the purpose in view. These principles were demonstrated to me in the case to which I have referred. In one hour and nineteen minutes, under ether, a large uric-acid calculus was

* *Transactions International Medical Congress*, 1881, vol. ii.

† *Birmingham Medical Review*, January, 1888.

reduced to fragments, and entirely removed from the bladder. On the fourth day the patient was convalescent. At that date I understood this operation had been practised fourteen times—including a case each by Dr. J. C. Warren and the late Dr. Curtis, of Boston—with one death. I was much indebted to Dr. Bigelow, not only for the full explanation he gave me of his method of operating, but also for permitting me to take part in the various manipulations. In August of the same year, I reported to the surgical section of the British Medical Association, at Bath,* what I had seen, and exhibited, I believe for the first time in England, Dr. Bigelow's apparatus. Very shortly afterwards I successfully performed the new operation, and have continued to do so since.

The anticipations expressed in reference to this operation were not unanimously favourable to it. The following passage from a leading medical journal contrasted strangely with the position the operation was about to take:—"We do not think that Dr. Bigelow's line of practice will meet with any followers in this country, and it is to be regretted that he has lent his name to a proceeding that is likely to bring discredit upon the operation of lithotrity—an operation which still has so many open opponents, that it more than ever requires to be saved from its friends."† It seems unaccountable that a writer, who was probably selected as being practically conversant with this

* *British Medical Journal*, 1878, vol. ii.

† *British Medical Journal*, August 3rd, 1878. Review of Dr. Bigelow's Work on Litholapaxy.

department of surgery, in thus giving expression to the doubts evidently entertained by so many as to the value of lithotrity as then performed, should, at the same time, have entirely misjudged the position of the proceeding which was soon destined to supplant it, and to be generally recognised by surgeons as an improvement.

Without further reference to the manner in which Dr. Bigelow's proposals were received, I will proceed to notice some of its details. As before stated, its object is to remove the stone at a single operation. To effect this painlessly, the patient is kept under an anæsthetic during the whole of the proceeding. In the removal of some large stones the time occupied has been considerable. In a case reported by Professor Cheever,* of Boston, the operation lasted three hours under ether; the stone was exceedingly hard, being composed of oxalate of lime. The patient made an uninterrupted recovery, and was kept in bed two weeks, much against his will. In a case where I successfully removed a stone weighing over two ounces, the operation lasted two hours and ten minutes. Reference is made to cases such as these to show that there need be no time limit, so long as the manipulations are carefully conducted.

The operation necessarily resolves itself into two parts—namely, the breaking of the stone into fragments, and the removal of the latter from the bladder. For crushing, I have not yet found any instrument superior to the smooth and fenestrated lithotrites

* *Boston Medical and Surgical Journal*, March 23rd, 1882.

commonly used in this country. I generally employ the former, whilst the fenestrated, or more powerful instrument, has been reserved for a few calculi, which, after being reduced by it, were then dealt with by the other. Stones which, by reason of their nature or size, cannot be crushed with either of these instruments, are, I believe, more safely treated by lithotomy.

The power and strength of these lithotrites are well illustrated by a case recorded by Mr. James Adams, of the London Hospital:—

A circular oxalate of lime calculus, more than an inch in diameter, was successfully crushed at one sitting, lasting an hour, and yielded five drachms of fragments. The fragments, after the first crushing, being found so extremely hard, the lithotrite was withdrawn, and a piece of steel placed within its jaws, and upon this the operator screwed up the instrument with all his force, and found it strong enough to withstand all that could be brought to bear upon it.*

The only objection raised to the use of these instruments is, that they are apt to become impacted, and thus retard the progress of the operation. I have never suffered much inconvenience from this contingency; probably because of the frequency with which I make use of the aspirator, with the object of keeping the bladder clear of all fragments capable of being withdrawn.

It is not until after the first crushing and aspiration that I inject water, with the view of retaining it during the remainder of the operation. I then keep the bladder tolerably distended. In determining the

* *British Medical Journal*, September 16th, 1882.

precise amount of water to be retained within the bladder during the operation, I have regard to two objects—(1) to reduce to a minimum the risk of any injury being done to the walls of the bladder by the instruments employed, and (2) to provide space for the movement of the fragments as they are broken by the lithotrite and withdrawn by the aspirator. A very little experience enables the surgeon to regulate this.

The second part of Bigelow's proceeding is the removal of the fragments. This is effected with urethral tubes (Fig. 10)—considerably larger than anything previously used for the purpose—and a suction apparatus, by which the fragments are withdrawn.

Without wishing to detract from the scientific accuracy and great value of Otis's* observations, which have undoubtedly contributed towards the development of the new operation for stone, it may be interesting to note that Sir Everard Home, in the following words, evidently anticipated the employment of larger urethral instruments than those in vogue

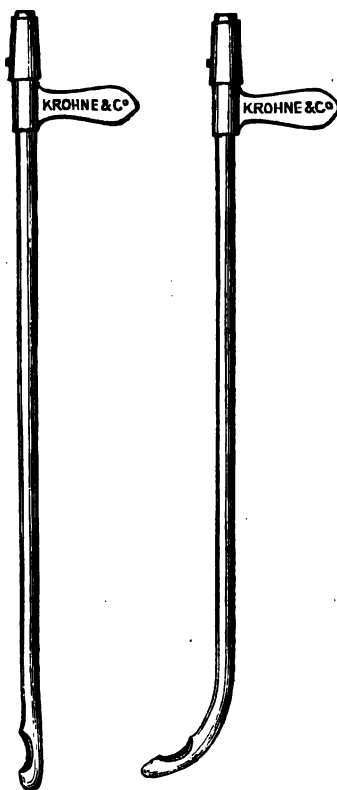


Fig. 10.

* *Stricture of the Male Urethra*, New York, 1880.

in his day:—"The width of the urethra varies in different parts of the canal, and is everywhere much larger than had been supposed, exceeding the size of the largest bougie in use in a very great degree." *

When the bladder is filled with water, and connected with the aspirator bottle by means of the evacuating tube, we have practically two reservoirs brought into communication in such a manner as to permit of an interchange of their respective contents,

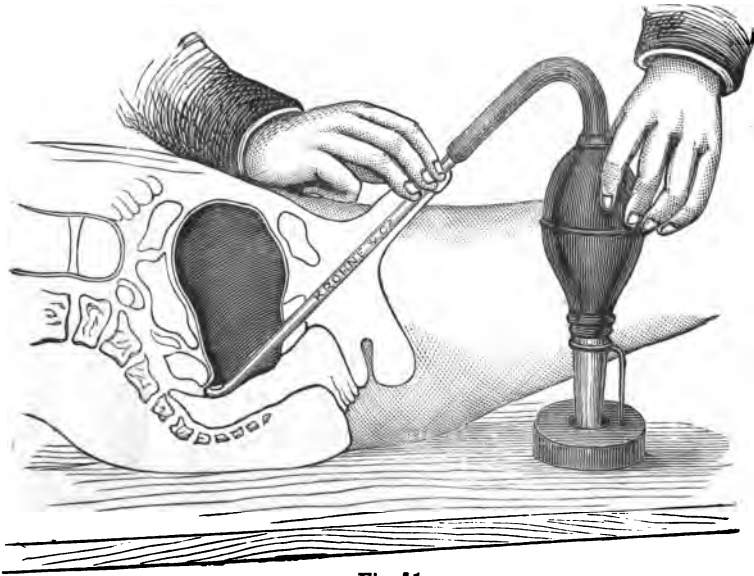


Fig. 11.

as shown in the figures. (Figs. 11 and 12.) This interchange is brought about by gently squeezing the aspirator with the hand. As the fragments of stone enter the aspirator, they fall into a glass receptacle at the bottom of it, in which they are detained. When

* *On the Treatment of Stricture, etc.*, 3rd ed., 1805, p. 24.

it is found that some of the fragments are still too large to pass through the evacuating or urethral tube, the lithotrite is again brought into use. The number of crushings and washings required depends on the size and hardness of the stone, and in some measure on the dexterity of the operator. Here those little

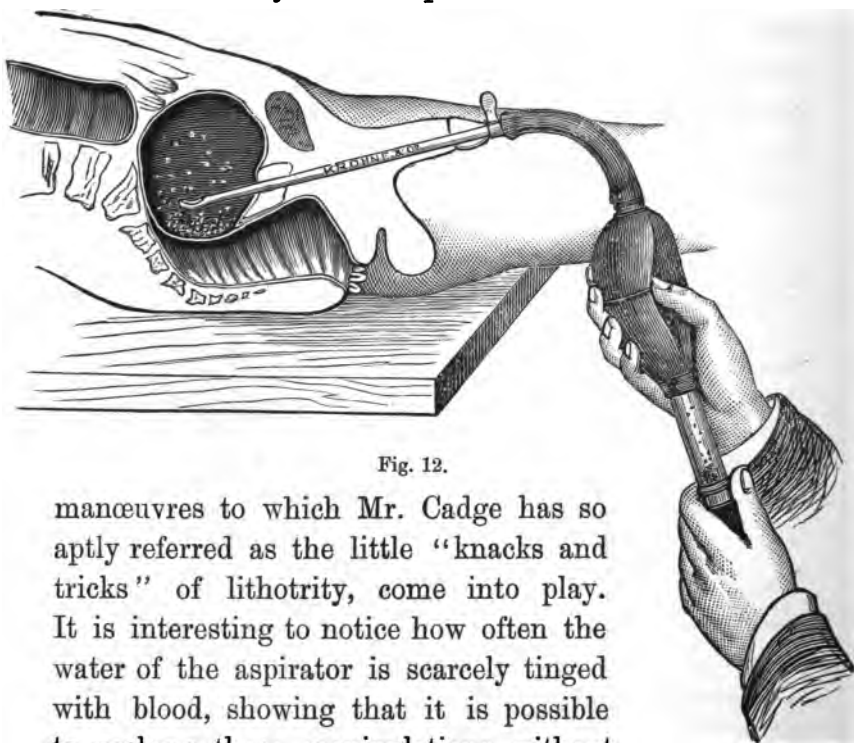


Fig. 12.

manœuvres to which Mr. Cadge has so aptly referred as the little “knacks and tricks” of lithotrity, come into play. It is interesting to notice how often the water of the aspirator is scarcely tinged with blood, showing that it is possible to prolong these manipulations without inflicting damage on the walls of the bladder.

There are one or two practical points connected with the aspirator or wash-bottle to which I will refer. After trying various modifications of it, I must express my satisfaction, so far, with the original instrument as represented in Figs. 11 and 12. Exception has been

taken to it on the grounds (1) that the trapping of the fragments is imperfect, and (2) that the apparatus permits air to enter the bladder. Admitting the truth of these objections to some extent, I am not disposed to think that the utility of the instrument is thereby seriously impaired.

I have been recently trying a simple form of aspirator, which has been described by Mr. J. H. Morgan,* where the position of the trap is altered. So far it has proved in my hands both convenient and free from needless complications. (Fig. 13.)

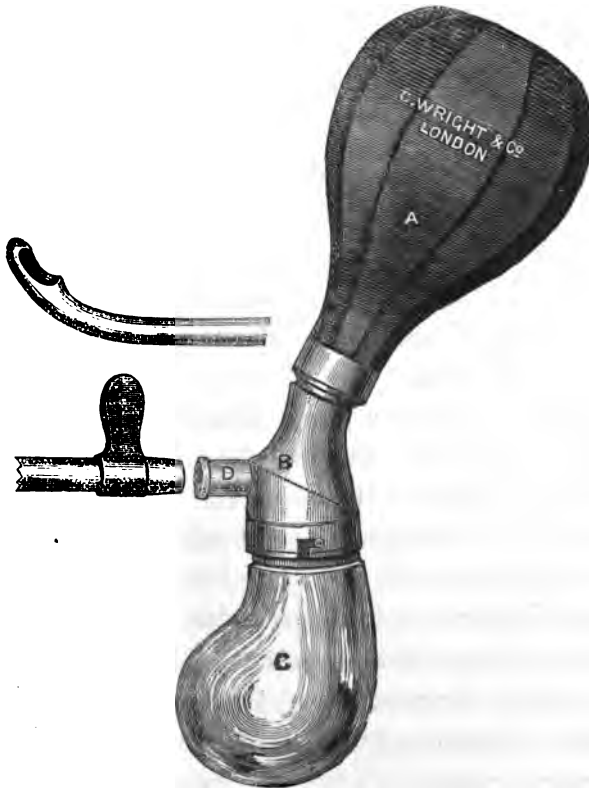


Fig. 13.

* *The Lancet*, September 2nd, 1882.

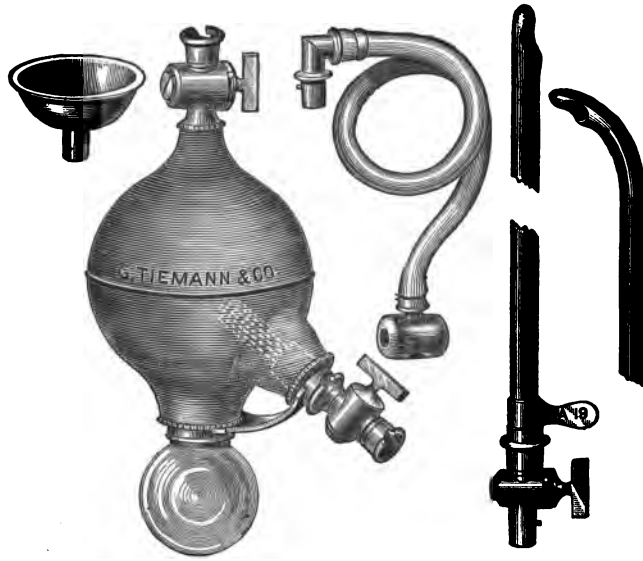


Fig. 14.

Fig. 14 represents Dr. Bigelow's most recent evacuator,* together with the apparatus belonging, but not essential to it—viz., a funnel and a hose, with an extra stopcock for the evacuating catheter. I have not yet had an opportunity of giving the instrument a trial.

I have not found a small quantity of air obstruct the necessary manipulations, for the reason, I suppose, that the air and the stone fragments tend to occupy opposite quarters in the bladder, and that where the one is, the other is not to be found. If enough air enter the bladder to interfere with the withdrawal of the fragments, or to provoke spasm, it is easily displaced by disconnecting the evacuating tube from the aspirator, and making pressure with the hand over the pubes.

* A Simplified Evacuator for Litholapaxy. *The Lancet*, Jan. 13, 1883.

In reference to the presence of air in the bladder, the following incident may be worthy of record, as it is a personal experience bearing upon this point :—

When I was going round the Hospital in Philadelphia, in 1881, in company with my travelling companion, the late Dr. McEwen, of Chester, Dr. Brinton called our attention to a case where a patient had made for himself an apparatus for washing out his bladder, which he demonstrated to us on his own person. The apparatus—a most efficient one—was constructed of a catheter with a large eye, the glass shade of a paraffin lamp, and the rubber of a breast pump. I remember the patient insisting that, by first introducing some air into his bladder, the process of washing out was much facilitated and rendered painless. I was struck at the time with this observation, and watched with interest the demonstration of it. The patient was under the impression that he was suffering from stone, but none could be found.

In manipulating the aspirator, I do not use the stand, as seen in Fig. 11, even in prolonged operations, as I have noticed that the fragments are withdrawn in greater numbers by making slight alterations—elevations, depressions, and rotations—in the position of the evacuating tube.

In selecting evacuating tubes, the object should be to use the largest the urethra will receive, provided it can be moved about easily. In some persons the meatus is so contracted that it is necessary to incise it before a sufficiently large tube will pass. This may be done as soon as the patient is under ether, and is subsequently an advantage to him.

Referring to the size of the evacuating catheters,

Dr. Bigelow remarks:—"31 is very rarely needed, and the French sizes, 28 and 29, are generally the most convenient. For a final washing or sounding without anæsthesia, when it is desirable to give the patient the least discomfort, even so small a calibre as 26 is sometimes useful."* A too tightly fitting catheter may damage the deeper portion of the urethra, which is less tolerant of injury than the bladder.

I generally use first a curved evacuating tube. (Fig. 10.) If the fragments do not escape freely through it after I consider that they have been sufficiently broken up, at the next washing I substitute a straight one (Fig. 10), which can be quite as easily passed by giving it, as Bigelow observes, "a rotation," as it temporarily hitches at the opening through the triangular ligament. In removing fragments, as well as in crushing them, there can be no doubt that the position of the patient is of much importance. Raising or lowering the pelvis often exerts a marked effect. Reliquet† advocates the employment of a special apparatus for this purpose, which I have seen Gouley, of New York, use with advantage. I have, so far, been able to secure desirable positions with pillows, but probably they are not so easily managed as the contrivance referred to, which is here figured. (Fig. 15.)

When using either the lithotrite or the aspirator, the bladder, even when the patient is deeply etherized, sometimes exercises a violent expulsive effort. Until

* *The Lancet*, January 6th, 1883.

† *De la Lithotritie rapide*, Paris, 1882.

this is over, all manipulations should be suspended, otherwise an accident might possibly happen. "Even deep anæsthesia," as Billroth observes, "is not always sufficient to obviate spasmodic action of the bladder."*



Fig. 15.

When manipulating with a considerable quantity of water in the bladder, if spasm comes on, I at once take off all tension by allowing an escape to take place—a sort of safety-valve action. I think this is a wise precaution.

Since the introduction of Bigelow's method, with the exception of small stones of insufficient size or consistence to test the proceeding, and which were unattended either with complications or untoward results, I have performed the operation on twenty-eight individuals, the amount of dried *débris* removed varying from one hundred to twelve hundred grains, the calculi being composed of phosphates, urates, and oxalates, separate as well as in combination. In two of these cases there was a fatal result.

* *Clinical Surgery*, Sydenham Society, 1881, p. 273.

In one, stone in the bladder was complicated with organic stricture in the membranous urethra. Seven days after the operation, and when the patient had left the Infirmary, rupture of the urethra, behind the stricture, and extravasation of urine, suddenly took place, and quickly caused death, in spite of free incisions wherever the vitality of the tissues was threatened. I saw this patient with Dr. Adam. Though the operation was extremely simple and easy, and the water in the aspirator, as I pointed out to my class at the time, hardly tinged with blood, it is possible that the manipulations may have further weakened a urethra which had long been diseased, and so contributed to the fatal result. Before performing lithotrity, I had dilated the urethra, so that the lithotrite passed readily.

I think if I had again a similar case to deal with, where the stricture was at all tight or chronic, I would prefer the cutting to the crushing operation; for with the latter it is impossible to avoid the contingency to which all persons suffering from stricture are somewhat liable—namely, peri-urethral abscess and extravasation of urine, and which in this instance caused the death of my patient. On the other hand, it is only fair to state that the extravasation might have been entirely unconnected with the removal of the stone.

The second fatal case was that of a gentleman, æt 77, whom I attended with Mr. Hakes. He had long suffered from urinary symptoms, but had persistently refused to be sounded. When the cystitis became extreme, and his sufferings most severe, he consented, and a uric-acid stone, about the size of a small walnut, was removed. The bladder was very contracted, a circumstance which rendered the operation more difficult than usual. In spite of the removal of the stone, apparently without damage to the parts, the cystitis continued, and caused death.

My remaining cases have all proved successful. In one instance there was a recurrence of calculous concretion, but the case took the form of cysto-phosphatic disease, dependent upon an enlarged prostate. Much relief from time to time was obtained by removing, with a scoop lithotrite, masses of mortar-like substance. While the patient took pains to wash out his bladder with slightly acidulated water, he kept free from these symptoms; when he neglected to do so, they returned.

I am here reminded of an observation that suggested itself to me on seeing the *post-mortem* examination of a patient upon whom lithotritry had been performed. On the completion of an operation, the amount of fragments removed should be roughly proportionate to the size of the stone, as determined by the lithotrite. In the case referred to, though the stone was a large one, only about seventy grains of uric-acid calculi were removed by several washings. As no more pieces could be felt, it was concluded that all had been removed. After death, the larger portion of the calculus was found completely concealed in a pouch, where it had probably originated the cystitis which proved fatal. The want of anything like a due relation between the fragments and the stone might, on a future occasion, lead to such precautions being taken as to bring about the discovery of a concealed fragment. In this case it is quite possible, had the saccule been suspected, the fragment might have been dislodged by placing the patient on his belly, or by adopting some other device, and then attempting to seize it with the

lithotrite before it had a chance of returning. I have elsewhere recorded a similar instance, where, in the old operation, a large portion of the calculus, after it had been broken, became concealed in a saccule, in which it excited fatal inflammation.* Here the recess was actually larger than the bladder itself.

I think it will be generally conceded that for all calculi of a moderate size, occurring in otherwise healthy male adults, lithotrity is the treatment which will give the best results. Stones within the dimensions represented by an ounce in weight, or thereabouts, are now painlessly removed at a single sitting with such safety and certainty as to render the proceeding as successful as any of the greater operations in surgery.† Even these limits are exceeded in

* *On the Surgical Disorders of the Urinary Organs*, 2nd ed., p. 379.

† In the following table I have given the weight of some calculi in the Museum of the Royal Infirmary, and the measurements of their longest and shortest diameters:—

No.	COMPOSITION.	Weight.	Long Diamtr.	Short Diamtr.
15	Uric Acid	343 grains	1½ in.	0½ in.
16	Urates and Phosphates	404 "	1½ "	1 "
17	Urates and Phosphates	317 "	1½ "	0¾ "
28	Uric Acid, Oxalate, and Phosphate	370 "	1½ "	0½ "
27	Uric Acid, Phosphate, and Oxalate	403 "	1½ "	0½ "
30	Oxalate and Phosphate	391 "	1½ "	1½ "
31	Urates, Oxalate, and Phosphate	387 "	1½ "	1 "
34	Uric Acid and Phosphate	402 "	1½ "	0½ "
36	Oxalate and Uric Acid	346 "	1½ "	1½ "
46	Uric Acid, Oxalate, and Phosphate	324 "	1½ "	1 "
55	Uric Acid and Oxalate	532 "	1½ "	0½ "
61	Uric Acid	347 "	1½ "	0½ "
62	Urates and Phosphates	320 "	1½ "	0½ "
63	Uric Acid	381 "	1½ "	1 "
135	Phosphates (perforated)	547 "	1½ "	1½ "
176	Oxalate and Phosphates	345 "	2 "	0½ "
177	Oxalate and Phosphate	324 "	1½ "	0½ "

the experience of surgeons now practically conversant with the details of the new operation, and who are furnishing illustrations of their practice in the columns of the medical periodicals. If there is one point upon which there seems to be a general agreement, it is that moderate-sized stones in adults, such as would be included in the dimensions I have indicated, are best dealt with by lithotritry. As Bigelow has observed, "we need no further statistics relating to small stones;" nor can much value be attached, as affecting the selection of the operation, to any more records of cases in which, from the small size of the calculus, or the absence of complications, there could have been no reasonable doubt as to the propriety of crushing.

The direction, I take it, in which information will still be of value is when the confines between lithotomy and lithotritry are reached—when the question arises whether to crush or to cut is the safer proceeding.* Where stones are unusually large, or where their presence is complicated with coexisting disease in the urethra, prostate, bladder, or kidneys, it cannot be said that there is a consensus of opinion as to the best method of procedure. Hence it is of importance that the profession should be furnished with records of cases in which complications such as I have indicated were present, or the stones unusually large.

D. L., a steward, was admitted into the Royal Infirmary on May 25th, 1882. For five years he had suffered from symptoms of stone. On examination with the sound, a large calculus could

* "Boundary Stones," as Mr. Teale calls them.—*Trans. International Medical Congress*, 1881, vol. ii.

be felt. The urine was acid, of sp. gr. 1010, and free from albumen. On May 30th, I had the patient placed under ether, and was prepared either to cut or to crush. On introducing the smooth-bladed lithotrite I found I had to deal with a stone of moderate hardness, having a diameter of very nearly three inches. Though the stone was exceedingly large, yet there was sufficient room in the bladder to allow of the requisite manipulation with the lithotrite; further, the urethra was of a full size, and there were no indications to lead me to infer that oxalate of lime entered into the composition of the calculus. I therefore determined, with the concurrence of my colleagues, Mr. Banks and Mr. Parker, to remove it by Bigelow's method. As the stone was too large to permit of its being cracked across with the lithotrite, I contented myself with first chipping away at its circumference until I had so reduced it in size that I could grasp it, and at the same time close the screw of the instrument. In this way I first broke it across with the fenestrated lithotrite, and then pulverized it with the smooth-bladed one. The operation lasted two hours and ten minutes, during which period the patient was kept under the influence of ether and chloroform alternately by my house surgeon, Mr. Stroyan. Somewhere about thirty washings were employed. There was very little hæmorrhage, and when all the *débris* had been removed, the bladder was washed out with water of a temperature of 100° F. The progress of the case may be very briefly stated. From first to last the patient never had a symptom which caused any uneasiness. On the evening of the tenth and a few subsequent days he had a rise of temperature, but without any other signs of fever or discomfort. This elevation was explained by the retention of some urine, and the lodgment of pus in the cavity or part of the bladder which this large stone had for so long occupied, and which was slow in recovering its contractile power. The pyrexia was of value in indicating that something was wrong and required explanation, though the sensations of the patient did not suggest this. By washing out the bladder twice a day with tepid

water the symptoms speedily disappeared, and thirty-two days after the operation the patient left the Infirmary to resume his occupation. The calculus was composed of phosphates with a small admixture of urates. The fragments, when dried, weighed two ounces and two drachms. Making allowance for a certain loss in the washings and crushings, the stone could not have weighed less than two ounces and a half, and is consequently one of the largest that has been successfully removed in this manner. I have to add that the lithotrites previously referred to, as well as Bigelow's original aspirator, answered their purpose admirably.

Amongst the cases in which large stones and concretions were removed in this way, I may mention one recorded by Mr. Walter Coulson, where the fragments weighed four ounces and one hundred and forty grains.* Mr. Thomas Smith † relates a case where four ounces of phosphatic stone *débris* were similarly dealt with.

Dr. Freyer, ‡ of the Bengal Medical Service, has published the particulars of twenty cases of litholapaxy in adult males, varying between the ages of 20 and 85, with only one death. This series includes one case where three and a quarter ounces of uric-acid stone were removed from the bladder in one hour and six minutes. The patient, who was in a miserable condition on admission to the hospital, left it in ten days after the operation in excellent health.

I would remark that it is in cases such as those I have cited that Bigelow's method comes out in strong contrast with all other proceedings having for their

* *Trans. International Medical Congress*, 1881, vol. ii

† *The Lancet*, January 10th, 1880.

‡ *Indian Medical Gazette*, Dec., 1882, and Feb., 1883.

object the removal of a stone from the bladder by first crushing it. By them we are enabled to recognise the tolerance of the bladder of prolonged instrumental manipulations, so long as they are judiciously employed; they show, moreover, the importance, as a part of the modern operation for stone, of the removal of all fragments from the bladder which are capable of exciting inflammation. But for the due recognition of these important principles, it seems likely that the field of lithotrity would still have remained comparatively limited.

When stone in the bladder is complicated, as it often is in elderly persons, with enlargement of the prostate, unless the hypertrophy is considerable, or of an unusual kind, lithotrity is not to be regarded as contra-indicated. Wherever, however, there is insuperable difficulty in readily seizing and manipulating the stone with the lithotrite, it will be expedient to substitute lithotomy. Under the same circumstances, an inability to discharge, spontaneously, the urine from the bladder may be a reason why it is safer to discard lithotrity. Hæmorrhage, even of the passive kind, which sometimes follows crushing, in a bladder completely atonied, and where there is no escape for the blood but by the urethra, is a serious contingency to provide against. A bladder that is capable of contraction is far less likely to continue to bleed, even after gentle manipulations, than one which is temporarily, if not permanently, paralysed.

The expediency of cutting, rather than crushing, is increased when there are grounds for believing that

the formation of a stone in the bladder is secondary to a large prostate. True, in many cases of enlarged prostate, the conditions favouring recurrence of stone after removal may be kept in abeyance by a moderate amount of attention on the part both of the practitioner and the patient. Still, on the other hand, there are cases of this kind where the state of the prostate occasions symptoms which are positively worse than the presence of the stone it has contributed to produce. Under these circumstances, lithotritry must be regarded as a palliative, rather than a cure.

At the Royal Medical and Chirurgical Society* I related two cases of enlarged prostate, complicated with stone in the bladder, where lithotomy not only cured the patients of their stone, but permitted the removal of large prostatic tumours, which it is probable would have induced symptoms of their own, if not re-formation of calculus. After a careful examination of cases of this kind, I submitted the following conclusion:—"That in determining the choice of lithotomy, or lithotritry, in cases where stone in the bladder is complicated with enlargement of the prostate, regard should be had to the possibility of removing both of these causes of annoyance by one operation—namely, by lithotomy." †

If, in a case where a person is suffering from stone as well as a large prostate, the former can be safely

* *Trans. Royal Med. Chir. Society*, 1882.

† In a communication recently received, Dr. John Ashhurst, jun., of Philadelphia, U.S.A., writes me:—"I have lately had occasion to remove an enlarged 'third lobe,' after median lithotomy for a broken catheter in the bladder, with the effect of giving the patient entire relief."

removed by lithotrity, it will be time enough to consider the propriety of adopting any other measures when a recurrence of the calculus takes place, attended in the meantime with symptoms of prostatic enlargement. Where, on the other hand, by reason of a large prostate, the operation of lithotrity will be rendered unusually hazardous, the propriety of lithotomy, having for its twofold object the removal of the stone and the possible improvement of the prostatic condition, may be reasonably entertained, in accordance with the conclusion that has already been drawn.

As indirectly bearing upon the treatment of far-advanced prostatic enlargement, complicated with stone in the bladder, Mr. Lund's* admirable case of prostatotomy, in which a silver tube was worn in the perineum for fifteen months, with great benefit, may be read with advantage. Had such a case been complicated with stone, as it might easily have been, how disappointing lithotrity would have proved. Lithotomy, on the other hand, would necessarily have led the way to the adoption of the only plan which seems to have afforded the patient a prolonged and not inconvenient relief, as it is recorded "that he had been able to come to business, and attend the Exchange, very rarely suffering any inconvenience from the presence of the tube."

There can, however, be no doubt that a certain degree of prostatic enlargement, which is to be measured by the effects that accompany it, rather than by actual size, by no means precludes lithotrity,

* *Trans. International Medical Congress, 1881.*

and that by a moderate amount of subsequent care re-formation of a stone may be avoided.

As in other disorders where operative treatment has to be considered, structural kidney disease is alike unfavourable for lithotomy and for lithotrity. It is, however, a question of degree, which often requires very fine balancing, and where some previous knowledge of the patient and his constitution is of material assistance. Whether to remove the stone by lithotrity or lithotomy, or not to remove it at all, contenting ourselves with making our patient's remaining days as comfortable as the resources of medicine and surgery will permit, are questions involving the gravest responsibility: so much depends on the mental and physical temperament of the patient; so little can we rely on rules having general rather than individual application.

My own experience leads me to believe that lithotrity usually produces less shock than lithotomy. The dread of undergoing an operation in which the knife is employed, though the pain may not be felt, is with most persons quite sufficient to turn the scale in favour of one in which the object can be attained without cutting. Considerations such as these, as well as others, must be entertained and carefully weighed.

Then, again, as I have just intimated, there are—very rarely, I believe—cases so complicated with other diseases that operative proceedings seem to be unjustifiable, if we may apply such a term to efforts, however misjudged, intended to prolong life. More than one case has come under my notice where I have

advised, with regard primarily to the state of the kidneys or other vital organ, that the removal of the stone should not be attempted, and have had the satisfaction of believing, if not of positively knowing, that the acceptance of my advice has been the means of permitting a person to live out his days with not more discomfort than surgery could completely alleviate. To a surgeon there is probably no position more trying or involving weightier responsibility, than that of declining or dissuading from an operation which, under other conditions, might be reasonably expected either to prolong life or to make it endurable.

As bearing on cases of the kind under consideration—obviously critical—I do not think there is an observation of greater value than one made by Sir James Paget. “Let me tell you of a symptom which must make you especially cautious if you have to catheterize elderly or old men. If they are passing large quantities of pale urine of very low specific gravity, whether containing a trace of albumen or not, they will be in danger from even the most gentle catheterism.” * Avoidable disregard of this warning I have seen followed by fatal suppression.

There is one circumstance, however, connected with this class of cases which, in my opinion, would render an operation for the removal of the stone justifiable, even in the face of the gravest forms of co-existing structural disease—that is, the presence of acute pain which is otherwise incapable of relief. In such a case I am disposed to think that lithotomy, as a rule, is

* *Clinical Lectures and Essays.*

preferable. The reason for my thinking so is that pain of exceptional character and intensity is generally spasmodic, occasioned by a stone in a contracted bladder, where crushing is less easily accomplished, and is not invariably followed, as I have seen, by that immediate sense of relief which usually attends lithotomy when performed under these circumstances. Immediate escape from agonising pain sometimes more than compensates for any shock occasioned by the operation necessary to give relief. It is the continuance of the same pain after the shock has been endured that we should be most wishful to avoid.

I have a few remarks to make in reference to the employment of lithotritry in children. Having regard to the good results obtained from lithotomy, it seems almost like heterodoxy to suggest resort to another operation. Such, indeed, was my own opinion until a few years ago, when I happened to be examining a number of calculi removed from children. Some of these stones were so small that it seemed to me they were capable of being pulverized by one or two grips of a lithotrite. As a preliminary to such a step, it was necessary that an accurate calculation should be made of the size of the stone. Working in this direction, and making some experiments with small calculi of various composition, and lithotrites reduced in size, I came to the conclusion that stones not exceeding three-eighths of an inch in their largest diameter might, in children, be readily disposed of with the lithotrite. The following is an illustration of this practice :—

John J., æt 11, a schoolboy, during the summer of 1881, was several times at the Infirmary for irritability of the bladder, which was suspected to be due to a stone, though it could not be distinctly detected. On September 16th, I saw him, and put him under ether. I then felt and seized a uric-acid stone, three-eighths of an inch in diameter. A second grip completely pulverized it. In the course of twenty-four hours the fragments were passed spontaneously, and the bladder emptied of them. He left the Infirmary in a week, and has since reported himself as quite well.

This case is an example of what I mean by lithotritry in male children, of which I treated several with successful results.

The following are the conclusions I have formulated for my own guidance :—

1. In children it is essential that an accurate knowledge of the size and shape of the stone should be obtained before any operation is decided upon. This information can be arrived at only imperfectly with the sound, but with precision by a small lithotrite. Volkmann's method of bimanual exploration of the bladder, with a finger of one hand in the rectum and the other hand above the pubes, may be practised. In thin subjects I have, in this way, been enabled not only to determine the presence and size of calculi within the bladder, but to diagnose deposits in the vesical walls. Exploration with the finger alone in the rectum is not of any service for this purpose.

2. Single stones, not exceeding three-eighths of an inch in any diameter, may be submitted to litho-

trity.* One or two grasps with the lithotrite will reduce them to pieces so small that they may be left to escape spontaneously by the urethra. Aspiration is not necessary, or even desirable.

3. When, in children, stones, though small, are multiple or exceed three-eighths of an inch in any diameter, lithotomy is to be performed.

It is in restricting lithotritry, as applied to children—if so simple a proceeding can be dignified with the name—to the limits indicated, that satisfactory results have been attained by me. The somewhat promiscuous manner in which this operation appears to have been practised in France is not to be recommended for imitation. Having regard to the smallness of the urethra, it cannot be expected that lithotritry should occupy so wide and increasing a range as with adults. The statistics of lithotomy in children leave but little room for improvement.

In reference to the after-treatment of lithotritry generally, there is not much to be said. A successful operation now leaves little more to be done than what

* The weight is stated of the following calculi in the Museum of the Royal Infirmary, where the greatest diameter did not exceed three-eighths of an inch :

No.	COMPOSITION.	WEIGHT.	SIZE.
92	Uric Acid and Phosphates . . .	3½ grns.	$\frac{7}{8} \times \frac{1}{2} \times \frac{1}{8}$
93	Urates and Oxalates	9 "	$\frac{1}{2} \times \frac{1}{8} \times \frac{1}{8}$
106	Urates	2 "	$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{8}$
110	Uric Acid	1½ "	$\frac{1}{2} \times \frac{1}{8} \times \frac{1}{2}$
127	Urates	2 "	$\frac{3}{8} \times \frac{1}{2} \times \frac{1}{8}$
148	Urates	4 "	$\frac{3}{8} \times \frac{1}{2} \times \frac{1}{2}$
149	Uric Acid	2 "	$\frac{3}{8} \times \frac{1}{2} \times \frac{1}{8}$

I am indebted to Mr. A. Barron for these measurements, in addition to other assistance.

is included under the terms warmth, rest, careful nursing, and suitable diet. Attention will be requisite in seeing that the bladder is properly emptied, and, if necessary, that it is also cleansed. A rubber catheter and an elastic bottle with some tepid carbolized water (1 in 100), are all that are necessary for this purpose. The importance of thermometric observations, morning and evening, has already been incidentally illustrated.

If the operation is followed by a high degree of local inflammation, we shall probably shape our course with special reference to the question of freedom of the bladder from portions of broken stone. If the symptoms become severe, and there is reason to suspect the presence of fragments, the re-introduction of the lithotrite as an explorer, and the immediate removal of the detritus, should any be discovered, is the most likely means of saving the patient from an otherwise inevitable fate. This has been done with success after the old method. The possibility, however, of such a contingency as incomplete removal must be remembered, in connection with any operation of lithotrity, since some part of the bladder may be rendered difficult of access, as previously mentioned.

It should not be forgotten that a calculus is a foreign body which, to a certain extent, the bladder has learnt to tolerate; but a broken calculus, together with the circumstances attending its fracture, sometimes prove capable of exciting the most urgent signs of its altered shape. I do not think it would be possible to compound a more inflammation-producing

material than that I once inspected in a bladder, the ingredients being—a broken-up uric-acid calculus, ammoniacal urine, pus, mucus, and blood, all having been maintained for some time at a temperature of about 100° Fahr. From consequences of this kind the introduction of Bigelow's proceeding has done much to preserve us.

In the slighter forms of inflammatory mischief after lithotrity, some light warm application to the abdomen, such as a bran poultice, generally proves most grateful. If there is thirst, there is no better diluent than barley or soda-water.

There is one other symptom which may follow lithotrity, especially if it has to be practised on an individual whose kidneys are not quite so competent as they should be. I refer to varying degrees of suppression of urine. I believe this condition to be connected with a more or less congested state of the kidneys. Where there is the slightest indication of this symptom, free diaphoresis should be induced with hot blankets. I have great faith in this. If there is one drug of more value than another, under these circumstances, it is digitalis, administered in teaspoonful doses, and prepared as a fresh infusion. In the suppression of what is known as urethral fever, it has been well spoken of by my friend Dr. Gouley, of New York. Dry cupping to the loins, and requiring the patient to lie partly on his abdomen on pillows, rather than flat on his back, are expedients which I have also thought to be useful in dealing with this symptom.

Bigelow's proceeding is well adapted for females of all ages; the size of the tubes requisite for the removal of the fragments does not expose the patient to the risk of urinary incontinence. My friend Dr. Rawdon, surgeon to the Children's Infirmary, also adopts this operation in female children, unless the stones are so small as not to endanger the continence of the bladder by the amount of dilatation to which the urethra is submitted in extracting them entire with the forceps.

In the case of very large stones, where the manipulations necessary to remove them by lithotrity might result in such an amount of damage to the urethra and neck of the bladder as to occasion that which is almost worse than the presence of the stone—namely, permanent incontinence of urine—vaginal lithotomy, and the immediate closure of the wound with sutures, is to be recommended. This operation has been practised with great success by numerous surgeons.

THE EARLY DETECTION OF STONE IN THE BLADDER.

THE early detection of a stone in the bladder is a matter of the first importance, as it may be generally stated that the risk of its removal is in direct ratio to its size. Every stone has a commencement, and though this by no means invariably takes place within the bladder, its arrival there is commonly only a question of time. Having once reached the bladder, it does not usually remain stationary; it increases, and may attain very considerable proportions. Writers on Surgery at the commencement of the present century, when knowledge of these diseases and the means of detecting them were less perfect than they are now, give frequent examples of enormous calculi, whose removal from the bladder was attended with great difficulty and danger.

The long periods of time that stones are sometimes allowed to remain and enlarge in the bladder, in spite of symptoms which have been continuously present, is very remarkable. Dr. Underhill * records a case in which he successfully removed a uric-acid stone, eight ounces in weight, by the lateral method. The patient was twenty-three years of age, and had had symptoms

* *The Lancet*, vol. ii., 1882.

from boyhood. Though in the present day it is difficult to explain instances of this kind, I think, as a rule, such want of perception is the fault of the sufferer rather than of the practitioner. I am disposed to connect the comparative safety at the present day of all operations for stone with the earlier recognition of the disease, and the application of the remedy under more favourable circumstances. There is still, however, room for improvement in this direction, and it may be well, therefore, to offer a few remarks on the means ordinarily adopted for detecting stone.

Though a stone in the bladder, however small, usually gives rise to symptoms of irritability or urinary distress which may be reflected elsewhere, its presence cannot be regarded as satisfactorily determined until it is detected by the touch. A tubercle in the wall of the bladder, or a tender prostate, produces symptoms closely resembling those of stone. Hence, as a rule, with hardly an exception, a stone must be felt before steps can be taken to remove it.

For the purpose of feeling a stone, we introduce a sound into the bladder. In something like ninety-five per cent. of suspected cases, this is a very simple proceeding, which may be conducted safely with almost any of the instruments used for this purpose. Sir Henry Thompson's hollow sound is popular with some surgeons, as it permits water to be injected into the bladder, should this be deemed necessary, without removing the instrument. Then there are small variations in the shapes and curves of these instruments, which individuals become attached to by reason

of previous good service and the dexterity acquired by long usage. My own sounds are solid steel, of the shape here delineated. (Fig. 16.)

There is one point in the construction of sounds upon which I insist—namely, that the stem of the largest size shall not exceed a No. 8 English catheter. Some sounds are so thick in this part that they actually fit the urethra, and consequently the bulb of the instrument cannot be made to pass as easily as it should do over all parts of the mucous membrane of the bladder, including the dip behind the prostate. The instrument I have a preference for (Fig. 16.) probably represents the most sensitive one of the kind, and will be found applicable, not only for determining the presence, size, and probable constitution of a stone, but for recognising other morbid conditions of the bladder where direct exploration is necessary.

A sort of compromise between the microphone and the ordinary sound has recently been suggested by Dr. James M. Davidson,* of Aberdeen. The name of lithophone has been given to this instrument, which is likely to be found useful in practice. It consists of an ordinary sound, with a hollow handle, in which a coil of rubber tubing is inserted. One end of the tube, fitted into an ivory button, is placed in contact with the ear of

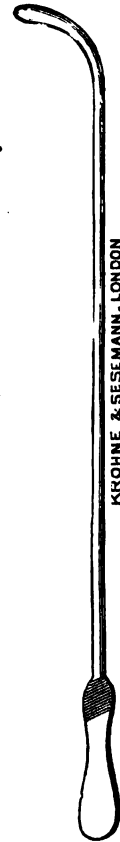


Fig. 16.

* *The Lancet*, July 1st, 1882.

the surgeon using it, when the presence of very minute particles of stone remaining in the bladder is revealed; another person may use the other end of the tube in a similar manner, and thus impressions be simultaneously conducted to two listeners. Or the surgeon may use the apparatus in the same manner and on the same principle as a binaural stethoscope. Though, in the detection of stone, reliance is mainly to be placed on the educated touch—the *tactus eruditus*—yet, in doubtful cases, advantage may be taken of an instrument such as this, by which impressions are not only conducted, but intensified. It may be used without the tubing, as an ordinary sound.

But it is not in reference to the ninety-five per cent. of adult cases that there is any difficulty either in sounding the bladder or in detecting a stone which, from its size, cannot be expelled spontaneously from that viscus. Occasional instances, which I have represented as about five per cent., present difficulties connected with the early detection of calculus, or the exploration of the bladder, which require notice.

Very few of us but can recall instances in which, even in the hands of experienced and skilful surgeons, the operation of sounding, simple and harmless as it usually is, has been followed by the most serious symptoms and even death—results directly attributable to the exploration that had been made. Of the cases that have come under my observation, which I have attributed to sounding, two were due to haemorrhage, in one of these this symptom was probably aggravated by

a long railway journey following shortly upon the examination); two to prostatitis and cystitis; one to prostatic abscess; and one to suppression of urine. In the last-mentioned case there was previous long-standing kidney disease. Similar effects, but in a less degree, have also been observed by me in other instances where a fatal result did not follow.

Most of us also, in our experience in the *post-mortem* room, have seen instances where bladders have become so misshapen as to present structural obstacles to the contact of a sound with certain parts of their interior where a stone may be lodged. A structural difficulty in the early detection of a stone in the bladder has been illustrated by Mr. Bickersteth,* in a specimen I had the opportunity of examining, and from which this drawing was made. (Fig. 17.)

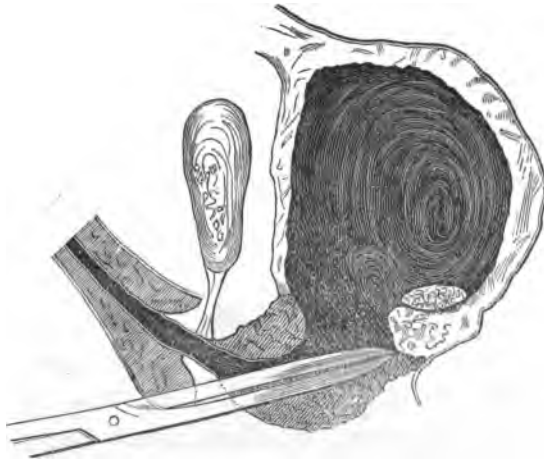


Fig. 17.

There are probably no urinary cases presenting

* *Liverpool Medical and Surgical Reports*, vol. i., 1867, p. 134.

greater difficulties, both in diagnosing and treating, than those of rugous or sacculated bladders, where phosphatic concretions are deposited on elevated and circumscribed portions of the mucous membrane. By the sound, something closely resembling a stone may be felt, but the absence of a distinct "ring," as the sound comes in contact with the suspicious spot, as well as its fixity in position—unalterable by the use of the instrument, by changes in the posture of the patient, and by distension of the bladder with water—render the diagnosis tolerably certain and easy.

I have frequently remarked, in examining the bladders of persons who have died with greatly enlarged prostates, or with saccules or bars across them, how impossible it would have been, if the cases had been complicated with stone, to detect it with the ordinary sound, provided the stone occupied a position I could indicate. These are the very instances where symptoms are sure to arise, sooner or later, simulating stone, and necessitating an exploration to determine the point. It is also in cases of this kind that serious, and sometimes fatal, consequences follow the attempt to demonstrate that which there is reason to suspect is present.

Such exceptional cases as these cause us seriously to reflect whether our means for sounding all persons are as perfect as they should be—whether, in fact, we do well in subjecting bladders with very different shaped entrances to similar processes of exploration. Many years ago it was pointed out that what seemed to be a very simple proceeding—viz., paracentesis for

ovarian dropsy—was under certain circumstances attended with a considerable mortality. I cannot help thinking, not only from what I have observed following the practice of others, but from some experience of my own, that there are structural conditions of the bladder where sounding, as ordinarily practised and described by writers, is attended with a risk which is not fully recognised and provided against. For a man to die unrelieved with a stone in his bladder is bad enough, but to have all chance of recovering from it removed by the process necessary for its discovery, is far worse.

In considering the structural obstacles to sounding the bladder, furnished chiefly by an enlargement of the prostate and the consequences it gives rise to, including bars within the area of the bladder, it should not be forgotten that though it may be physically impossible, without the use of force, to bring the sound to the stone, or suspected spot, it is feasible, by changes in position, by filling or emptying the bladder with water, by a finger in the rectum, by pressure above the pubes with the hand, and the like, to bring the stone to the sound, and thus obtain the evidence required. Still, measures of this kind will not meet all the conditions included in my category of difficulties.

With the view of overcoming such structural obstacles as I have endeavoured to point out in general terms, rather than by the narration of individual cases, I have been resorting to some expedients, which I will briefly describe.

A careful study of the alterations* effected in the passage by which the bladder is immediately entered in prostatic enlargement, as well as of the variations in the form of urethral instruments used under these circumstances, leads me to conclude that though a certain shaped sound may represent the best average for ninety-five per cent. of the cases requiring such an instrument, yet it is not adapted for the other five, or thereabouts, and that something better might be substituted.

Working in this direction, and attentively observing cases in which, by reason of an enlarged prostate, the process of searching the interior of the bladder was rendered more than usually painful with the ordinary shaped sound, I have been trying several modifications, which have proved efficient both in detecting the presence or absence of stone, and in diminishing the risk which has already been referred to.

A long copper probe (Fig. 18), sufficiently flexible for adaptation to any shape required, is an instrument I have used with advantage in cases such as these. We know how a slight alteration in the curve may make all the difference in the facility with which the bladder is entered when the prostate is enlarged or the prostatic urethra in any way distorted; further

* Whilst preparing these pages for the press, I incidentally note the record of a case in a most interesting paper by Dr. Keyes, on Pneumo-uria, which has just reached me (*Medical News*, U.S.A., Dec. 16th, 1882), where it is stated, "The prostate was quite large, and its canal distorted, thus explaining why no instrument had found its way into the bladder." How, in a case such as this, had it been necessary to explore for stone, a rigid instrument could be made to enter the bladder without inflicting structural damage, is one of the points I have now under consideration.

than this, the instrument, by yielding a little as it proceeds, enables the surgeon to reach round the prostate without putting the parts so greatly on the stretch as would be the case with a rigid steel sound. Bigelow, I see, states that he usually searches for a stone with a common tin sound, bent extemporaneously to suit the case.

Having at hand ordinary steel sounds of various curves and shapes I find exceedingly useful. When I meet with obstruction at the neck of the bladder from a large prostate, I try one or two of different curves, with the result generally of discovering one that enters without difficulty. Here is a shape that often passes, and can be rotated easily. (Fig. 19.)

Again, I sometimes use flexible sounds tipped with steel; these, though not so sensitive as the ordinary instruments, have the advantage of adapting themselves to the curvature both of the prostatic urethra and the bladder, whilst they are still capable of eliciting a "note," and determining the presence of a stone. (Fig. 20.)

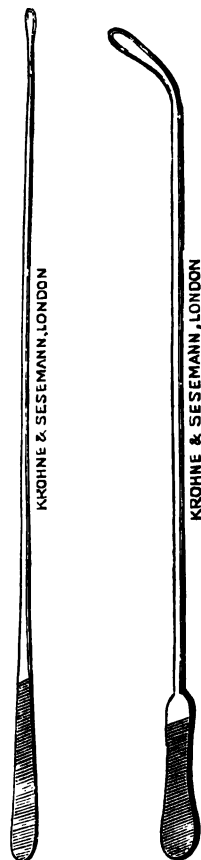


Fig. 18. Fig. 19.



Fig. 20.

It may be objected, with regard to the selection of the cutting or the crushing operation, that the mere knowledge that a patient has a stone in his bladder, without further information as to its size, shape and probable constitution, places us in hardly any better position than we were before. Still, the consciousness that even this knowledge was arrived at by the employment of exceptional means cannot fail to be of service when plans for the removal of the stone have to be considered.

The precise mode of operating for stone may not be determined upon, as Mr. Teevan* remarked, until we are prepared to remove it—"to crush if possible, to cut if necessary"—alternatives which can sometimes be best judged of when the patient is etherized, and the difficulties of dealing with the stone are fully appreciated. Very little harm would come of sounding, even should structural obstacles exist, if the removal of the stone followed immediately the necessary exploration, upon which action has to be taken. Hence, I am not disposed to undervalue the mere discovery of the fact that a stone is present. Further information about it may be coincident with its removal.

In speaking of cases in which sounding for stone has been attended by untoward consequences, I am not of course including those in which the mere passing of an instrument along the urethra has provoked the symptoms and events which have been so well described and illustrated by Mr. Banks;† nor those examples in

Trans. International Medical Congress, 1881.

† "Rapidly fatal cases of Urethral Fever."—*Edinburgh Medical Journal*, June, 1871.

which it would be possible to attribute the results to any want of skill or of experience on the part of those having the care of them.

Though the difficulties to which I have referred arise most frequently from procrastination or want of observation on the patient's part, whereby complications ensue upon stone, the disease itself having originated from morbid conditions connected with the bladder which might have been corrected by timely assistance, yet this consideration in no way affects our responsibility in such cases. We have to take things as they are, and, in dealing with them, endeavour to demonstrate that surgery provides for exceptions as well as apparent rules.

Sounding may be practised under the following circumstances, when the cause is not otherwise explicable, or symptoms pointing to the bladder continue in spite of treatment.

1. In the vesical irritability and incontinence of children.
2. In children suffering from sudden interruption to micturition, from retention of urine, blood in the urine, and penile irritation inducing the pulling of the foreskin.
3. In children suffering from prolapse of the bowel.
4. In the vesical irritability of adults after attacks of renal colic, where there are reasons for believing a calculus may be retained in the bladder.
5. In cases of hæmaturia of a doubtful nature.
6. In pain after micturition, referred to the end of the penis.

7. In cases of chronic muco-purulent or ammoniacal urine, or where the urine contains, on standing, an excess of cloudy mucus.

8. In the enlarged prostate of elderly persons, with persisting symptoms of vesical irritability.

9. Where calculi, or portions of them, have been spontaneously passed, and symptoms of vesical irritability continue.

10. In cases of acute vesical spasm terminating the act of micturition.

11. In cases where, though the bladder contains but little urine, there is frequently a sudden and uncontrollable desire to micturate.

Though the indications of stone may be numerous, it will be seen that they all have reference to either (1) a persisting source of irritation within the bladder, or (2) mechanical interference with the act of micturition. The smaller the stone, the slighter are the symptoms it usually produces, but the greater is the necessity for their early recognition.

TAPPING THE BLADDER FROM THE PERI- NEUM THROUGH THE HYPERTROPHIED PROSTATE.

TAPPING the bladder is an operation which is not often necessary; I believe, however, it may occasionally be required even when a catheter can be passed. Assuming it to be called for, how is it to be done?

Tapping with the aspirator-needle above the pubes is a safe proceeding, and, as affording temporary relief, is to be recommended. A surgeon who finds himself in difficulties with a distended bladder, a large prostate, and false passages, is likely to do less harm with the needle than with the catheter, and is sure to give relief. Taking off the tension by withdrawing the urine generally permits the instrument to pass on the next trial. This expedient, however, can only be used for temporary purposes.

Tapping the bladder above the pubes with a trocar, for the purpose of establishing a more or less permanent vent, is very much like opening an abscess at its least dependent spot. Urine ascends the cannula against gravitation, and the products of inflammation of the bladder, usually present in some degree, remain behind in the pouch, undischarged. Tapping through the rectum requires the retention of the cannula in the bowel, and is thus an obstacle to defæcation.

Forcing the end of the catheter through the enlarged prostate is an unsurgical proceeding, not to be entertained. Tapping the membranous urethra, though desirable in some cases of tight and complicated stricture, leaves us in the position of having the obstructing prostate behind the opening.

There is a point in the wall of the bladder, unconnected with peritoneum, through which a trocar and cannula may safely be passed: I refer to the prostate gland, which in old men, in whom paracentesis is more frequently required, often affords a considerable area for the operation. I will illustrate this method by the following case, only premising that I had previously recognised its propriety, and tested it on the dead subject. I then had the instrument made for the purpose; but, though having frequent opportunities for dealing with retention of urine under all circumstances, it was not till recently that a case in point presented itself. I mention this in order to explain how I came to be prepared, instrumentally, for doing that which I will briefly describe.

N. D., aged 84, was admitted into the Liverpool Royal Infirmary at 2 a.m. on November 4th, 1881. My house-surgeon, Mr. Laimbeer, found him bleeding from attempted catheterism, with a large prostate, and a distended bladder. Recognising the urgency of the case, and finding catheterism impracticable, he emptied the bladder with the aspirator above the pubes. I saw the patient a few hours afterwards, and found he had not passed urine since, and that no catheter could be introduced. His tongue was brown, and he was much exhausted. Later on, I again visited him, when the bladder had become fully

distended. I then had him placed under ether, and succeeded in passing a gum-elastic prostatic catheter. The success of this procedure having been demonstrated, I refrained from drawing off more urine, recognising that then either the catheter must be retained, or re-introduced when required; neither of which proceedings I was disposed to recommend. Retaining a catheter in the bladder of an old man, somewhat childish and disposed to remove any appliance if not closely watched, is not easy; and, if accomplished, often ends fatally, from cystitis, pyelitis, and exhaustion. This was a case where, in my judgment, it was wisest to establish a permanent drain; and to effect this in the manner on which I had determined, required a tense, and not a flaccid, bladder.

I had the patient placed in the usual position for lithotomy. Taking a trocar which had been made for the purpose, with a silver cannula, I introduced it in the median line of the perineum, three-quarters of an inch in front of the anus, and pushed it steadily through the prostate into the bladder, at the same time retaining my left index finger in the rectum for a guide. On withdrawing the trocar, a large quantity of ammoniacal urine escaped. The cannula, being provided with a shield, was secured in its place by tapes much in the same way as a tracheotomy-tube. A piece of india-rubber tubing was attached to the portion of cannula which projected beyond the shield, and conveyed the urine into a vessel placed at the side of the bed. Through this tubing urine continued to dribble. The patient was at once made comfortable by this arrangement, and in forty-eight hours he was up, sitting in an easy-chair—an important matter with old persons. To permit of this, the rubber tubing is shortened during the day-time, the end of it being tucked through a light abdominal belt, where it is compressed by a small pair of bulldog forceps, which are removed when the patient desires to pass urine. He is quite as well as most men are at eighty-four years of age. He gets up daily,

takes his food, and sleeps comfortably, either on his back or his side, without any narcotic, and is quite free from any urinary inconvenience other than wearing the tube. During the night his sleep is not broken by calls to micturate or pass catheters, as his urine runs off by the tubing as it is excreted; whilst, in the daytime, when he is up and about, his act of micturition practically resolves itself into something equivalent to the turning of a tap. His urine, which had been foetid and ammoniacal, is now nearly normal, the bladder being readily washed out by applying a syringe to the cannula twice a day. On two or three occasions the cannula has accidentally slipped out whilst the tapes were being changed, but has been readily replaced by the nurse. The somewhat enthusiastic manner in which the patient compares his present with his past condition cannot be allowed to pass entirely unnoticed.

The operation was devised much on the same lines I endeavour to take in commencing my lithotomy incision—namely, the selecting of a point in the perineum where no vessel of importance is endangered. My object in planning the operation was to obtain what I may best describe as a short low-level urethra, adapted to the altered relations of the bladder to the prostate when the latter becomes enlarged, for the purpose of securing the most complete drainage. I should add that, since the tapping, the patient has, as far as we are aware, only passed a few drops of urine by the urethra.

For about six weeks after the bladder was tapped, the patient passed urine entirely through the prostatic cannula. His health rapidly improved, and he was able to go about as if nothing ailed him. Then it was noticed that urine in gradually increasing quantities began to flow through the natural passage, so much so as to lead me to infer that, for some reason or other, the prostate was ceasing to obstruct micturition. On January 28th, 1882, I removed the cannula; the punctured wound healed in the course of a few days, and with this the bladder gradually

recovered its natural function and power. The patient now holds his urine for two or three hours at a time, and at night he only requires to urinate twice or thrice. It may be said that the functional symptoms of enlarged prostate have almost disappeared.

The history of the patient pointed to the presence of the usual symptoms of enlarged prostate obstructing micturition, though we could not conclude that complete retention had ever previously occurred. On the day of his admission into the Infirmary it was ascertained by careful rectal examination, both by Mr. Laimbeer, my house-surgeon, and myself, that the prostate was greatly enlarged; upon this point there could be no doubt. After the tube had been removed, on the date mentioned, we found evidence, from a similar examination, that the prostate had undergone a marked diminution in size; in fact, but little that was abnormal could then be detected. I saw this patient on February 24th, 1883; he was in perfect health, and free from all urinary troubles.

Here, then, we have a case where a surgical proceeding on an enlarged prostate was followed by its rapid atrophy—a result which, as far as I know, has not been noted before. It may be urged that rectal examination affords evidence as to the state of only one side of the enlargement; it must, however, be remembered that return of the power and function of micturition warrants a conclusion that a corresponding change had occurred in the vesical aspect of the gland. Atrophy of the prostate following incision is a result I have occasionally observed in connection with the operation of lithotomy in elderly persons; it has, I believe, happened under similar circumstances to the normal gland. It is probable that the retention of a

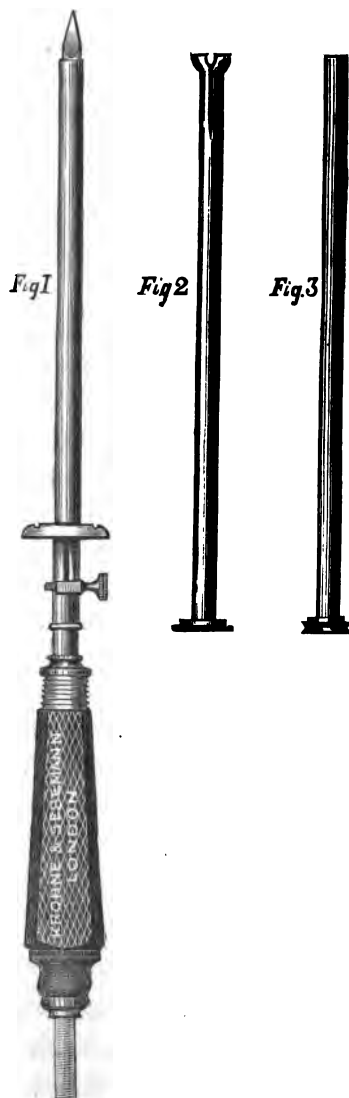


Fig. 21. *

* Fig. 1 represents the trocar with cannula complete. A piece of india-rubber tubing is to be attached below the collar of the cannula on withdrawal of the trocar, to convey the urine into a receptacle.—Fig. 2. Silver cannula, which is introduced in tube of Fig. 1 to form a probe end, and for retaining it.—Fig. 3. A plain silver tube with which to clear tube (Fig. 2), in case of its becoming blocked up.

cannula in the prostate for a period of over two months may have induced changes in the gland similar to those observed to follow the use of setons, where wasting of the adjacent tissues takes place.

I record this case, not only as illustrative of a proceeding which is to be recommended as an addition to our resources for the treatment of retention of urine in association with enlargement of the prostate, but as bearing upon the radical treatment of an affection for which little has hitherto been done.

Commenting upon this case, Professor Gross remarks:—"When the bladder is chronically inflamed, from enlargement of the prostate gland, tapping may be performed through this organ, as was recently suggested and successfully practised by Mr. Reginald Harrison. . . . My conviction is, that this operation is destined to come into general use in this class of cases, of such frequent occurrence in advanced life, and a source of so much suffering." *

The trocar and cannula employed for this purpose (Fig. 21) have been made for me by Messrs. Krohne and Sesemann. The trocar is hollow, and urine escapes through it by the handle immediately the distended bladder is entered. The shield on the cannula is movable, and can be fixed at any desired position to suit the varying depth of prostate and perineum. The instrument may be used for other purposes where tapping or exploration is necessary.

* *A System of Surgery*, sixth edition, 1882, vol. ii., p. 703.

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